SECTION 02821

CHAIN LINK FENCES AND GATES

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LANL MASTER CONSTRUCTION SPECIFICATION

When editing to suit project, author shall add job-specific requirements and delete only those portions that in no way apply to the activity (e.g., a component that does not apply). To seek a variance from applicable requirements, contact the discipline POC.

Refer to Civil Standard Drawings, ST3831 for security fence details. Note: LANL Physical Security will determine fence fabric, height and other security fencing fencing requirements as noted in this specification. Designs for heights exceeding 16 feet shall be reviewed by a structural engineer.

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PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fence framework, fabric, and accessories

B. Pedestrian and vehicle gates.

C. Concrete.

D. Electrical grounding.

1.2 LANL PERFORMED WORK

A. Indicate location of fence lines, gates, and terminal posts with suitable stakes at intervals not exceeding 500 feet or line of sight.

B. Indicate utility locations, USC&G benchmarks, property monuments, and other underground structures.

C. Obtain excavation/soil disturbance permit for Contractor.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01300:

1. Catalog data on fabric, posts, accessories, fittings and hardware.

2. Two legible copies of batch tickets for each load of concrete to the LANL Construction Inspector.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle structural steel without damaging finish.

B. Deliver manufactured materials in original unopened packages, containers, or bundles with manufacturer's label intact and legible.

C. Store materials off ground, under cover, and away from damp surfaces.

D. Remove damaged unlabeled or unsatisfactory materials that do not meet this specification from the job site.

1.5 QUALITY ASSURANCE

A. Comply with the following unless otherwise noted.

Federal Specification RR-F (http://stinet.dtic.mil/)

191K	General Specification
191/1D	Fabric
191/2D	Gates
191/3D	Posts, Rails and Braces
191/4D	Accessories

American Society of Testing and Materials

ASTM F-552	Definition of Terms
ASTM F-567	Installation
ASTM F-626	Fence Fittings
ASTM F-669	Strength Requirements
ASTM F-900	Gate Construction

PART 2 PRODUCTS

2.1 MATERIALS

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Some secured areas may require 9-gage (0.148) inch fabric. Consult with LANL Physical Security.
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A. Fabric: ASTM A392, Class 1, zinc coated (1.2 ounces), steel wire/fabric, 2 inch mesh size, 11-gage (0.120 inches) coated wire size, galvanized before weaving, with twisted barbed selvages top and bottom.

B. Posts, Rails & Braces: ASTM F1083 galvanized steel pipe.

C. Galvanizing: ASTM A123, unless otherwise indicated, provide hot-dipped, zinc-coated accessories of ferrous material with weight of zinc coating not less than 1.2 ounces per square foot.

D. Barbed Wire: ASTM A121 metallic coated steel, Type Z zinc coating strand wire, 12-1/2 gage (0.099 inches) steel wire, 4 barb points, 14 gage (0.080 inches) spaced on 5 inch centers.

E. Razor Ribbon: 430 stainless steel, 0.6 mm thick by 25 mm wide, 18 inch diameter helical coil, die stamped to produce 4 barbed points at 10 mm on center, cold rolled around a galvanized steel core wire. Aluminum ties not acceptable.

F. Outrigger (Extension arm): Galvanized pressed steel.

G. Concrete: ASTM C94, Normal Portland Cement, 3000 psi strength at 28 days, 3 inch slump, 0.75 inch nominal sized coarse aggregate.

2.2 BASIC FENCE SYSTEM COMPONENTS

A. Terminal Posts: (Angles, corners, ends, and pull posts) 2-1/2 inch Schedule 40 for fence height up to 8 feet and 3 inch Schedule 40 for fence height over 8 feet and equal to or under 16 feet.

B. Line Posts: 2 inch Schedule 40 for fabric height up to 8 feet, 2-1/2 inch Schedule 40 for fabric height over 8 feet and equal to or under 16 feet.

C. Braces at Terminal or Gateposts: 1-1/4 inch Schedule 40.

D. Tension Rods: 3/8 inch diameter galvanized steel with turnbuckle end fitting type tighteners.

E. Tension Wire: 7-gage coil spring, hard tempered carbon steel wire.

F. Tension Bars: 3/4 x 1/4 inch thick galvanized steel.

G. Tension Bands: 3/4 x 1/10 inch (nominal) galvanized steel offset bands.

H. Brace Bands: 3/4 x 1/10 inch (nominal) thick galvanized steel.

I. Brace Ends: Cupped fittings of formed steel or cast iron with ears for attaching horizontal braces to brace bands and for connecting diagonal tension rods.

J. Wire Ties: Same gage material and coating as fabric.

K. Post Caps: Formed steel, malleable cast iron, or aluminum, sized to post diameter, with set screw retainer.

L. Hog Rings (Razor Wire): 10 gage steel, galvanized.

M. Gate Posts:

1. Gate Leaf - Widths up to 6 Feet: 2-1/2 inch Schedule 40.

2. Gate Leaf - Widths up to 12 Feet: 3-1/2 inch Schedule 40.

3. Gate Leaf - Widths up to 18 Feet: 6 inch Schedule 40.

4. Gate Leaf - Widths up to 23 Feet: 8 inch Schedule 40.

N. GATE FRAMES

1. Gate Leaf - Widths Less than 10 Feet: 1-1/2 inch Schedule 40.

2. Gate Leaf - Widths 10 Feet to 16 Feet: 2 inch Schedule 40.

3. Gate Leaf - Widths Greater than 16 Feet: 2 inch Schedule 80.

2.3 FENCE GROUNDING

A. Grounding Cable: No 4/0 AWG bare, stranded, soft temper copper cable conforming to ASTM B8, Standard Specification for Concentric-Lay stranded Copper Conductors.

B. Flexible Braid: Tinned copper braid with tinned copper ferrules; minimum 250 ampere rating; 12 inch minimum length. O-Z/Gedney Type FB

C. Cable to Pipe Clamps: NRTL (National Recognized Testing Laboratory) listed copper alloy connectors with silicon bronze hardware for making cable to pipe connections. O-Z/Gedney Type ABG 1-1/2 inch and smaller, Type CG 2 inch and larger pipe diameter.

D. Flexible Braid to Pipe Clamps: NRTL listed copper alloy connectors with silicon bronze hardware for making braid or copper bar to pipe connections. O-Z/Gedney Type RG.

PART 3 EXECUTION

3.1 SITE PREPARATION

A. Notify LANL Construction Inspector 10 days prior to start of construction to identify known utilities and stake and flag locations.

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Specify site specific clearing and grading requirements in the specification or on the drawings.
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B. Before installing chain-line fence, perform site clearing and grading as noted on Drawings.

C. Allow footing to cure minimum 7 days before installing fabric and other materials.

3.2 GATES

A. Provide non-lift-off type gate hinges sized for gate of adequate strength with large rearing surface for clamping in position so that hinges do not easily twist or turn with gate action.

B. Provide diagonal tension rods for gates over 6 feet in width.

C. For gate leaves greater than 8 feet in any direction, provide intermediate braces placed symmetrically so that frame members, including bracing, are spaced not further than 8 feet. Provide braces same size as those called out for fence.

3.3 LATCHES

A. Single gates less than 10 feet wide may use forked type latches.

B. Provide single gates, 10 feet or more wide, and inactive leaves of double gates with positive latching devices at top, bottom and center of closing edges such as fork type latches with full gate height plunger bar or rod.

C. At double gates, provide locking devices that retain both gate leaves in same plane when closed.

D. Arrange plunger bars and rods so that they engage gate stops and cannot be raised when locked.

E. Rigidly weld brackets for plunger bars holders to inactivate leaves.

F. Arrange latching mechanisms at double gates so one padlock can lock both gate leaves at center latch integral to gate.

G. Install keepers consisting of a mechanical device for securing free end of gate when in full open position.

3.4 POSTS

A. Space line posts equidistant at intervals not exceeding 10 feet. Measure interval parallel to grade of proposed fence and in line of fence from center to center of post.

B. Set terminal posts (end, corner, and gate) at beginning and end of each continuous length of fence and at abrupt changes in vertical and horizontal alignments.

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The following post footing dimensions are based on normal soil conditions. Verify actual soil conditions with LANL Structural Engineer.

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C. Set fence and gate posts in concrete in holes of diameter and depth as follows:

1. Minimum Diameter: Four times outside diameter of post.

2. Minimum Depth: 36 inches plus an additional 3 inches for each 1 foot increase in fence height over 4 feet.

D. Set posts in a vertical position, plumb and in line. Backfill concrete into excavation and extend 2 inches above grade. An alternative method is to stop footing 2 inches below grade to allow for cover with sod, black top, or other materials. Crown concrete at top to shed water and extend minimum of 2 inches below bottom of post.

E. When solid rock or concrete is encountered, without an overburden of soil, set posts in solid rock or concrete. Depth of hole shall be twelve times the largest cross section of posts. Diameter of hole shall be 6 inch greater than largest cross section of post.

F. The use of sleeves in order to leave voids in new concrete construction is recommended.

G. Half-fill the void with non-shrinkable hydraulic cement and force post to bottom of hole and plumb. Thoroughly work additional grout into hole so as to leave no voids. Crown grout to shed water.

H. Provide tension offset bands fitted around terminal posts at maximum 15 inch intervals to attach tension bars to posts.

I. Provide brace center band to secure brace ends and tension rods to post.

3.5 FABRIC

A. Place chain-link fabric on outside of area enclosed. Locate posts, bracing, and other structural members on inside of secured perimeter.

B. Place fabric by securing one end, applying sufficient tension to remove slack before making attachment elsewhere. Tighten fabric to provide smooth uniform appearance free from sag.

C. Cut fabric by untwisting a picket and attach each span independently at terminal posts. Use stretcher bars with tension bands at maximum 15-inch intervals or any other approved method of attachment.

D. Install fence fabric 2 inches maximum above ground level. Fasten fabric to line posts at intervals not exceeding 15 inches. Fasten fabric to rail or tension wire at intervals not exceeding 24 inches.

E. Join rolls of wire fabric by weaving a single picket into ends of rolls to form continuous mesh.

F. Provide continuous length tension bars equal to fence height and located wherever chain link fabric end attaches to terminal post. Thread bars through fabric ends for full height, and attach to posts by tension bands.

G. Provide wire ties for attaching chain link fabric to tension wires at maximum 18 inch centers and fence posts at maximum 24 inch centers.

3.6 BARBED WIRE

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LANL Physical Security will determine if barbed wire is required, number of strands, and type of outrigger.
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A. Fencing: Top fencing with [3] strands of barbed wire on each outrigger. Provide [vertical outriggers] [single 45 degree outriggers] [double 45 degree outriggers]. Angle single outrigger away from security area.

B. Pull taut to remove sag, firmly install barbed wire in slots of extension arms, and secure to post or terminal arm.

C. Gate: Install barbed wire strands at 6 inches on center between extended gate frame members above gate fabric.

3.7 RAZOR WIRE

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LANL Physical Security will determine if razor ribbon is required and loop spacing.
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A. Top fencing with razor wire at loop spacing of [ ] inches.

B. Fencing: Provide 45 degree double outriggers with 2 strands of barbed wire in each outrigger. Pull wire taut to remove sag, and firmly install barbed wire in most inner and outer slot of outrigger. Attach razor wire to barbed wire with hog rings.

C. Gate: Provide one strand of barbed wire to top of extended gate frame and pull taut to remove sag. Secure razor ribbon to barbed wire and top selvage of gate fabric with hog rings at maximum 9 inches centers. Razor ribbon loop spacing same as fence.

3.8 GATES

A. Install gates true to opening and plumb in closed position.

B. Hang gates so that bottom of gate is as close to ground as practical (2 inches max.) while allowing sufficient clearance for free operation through at least 90 degree in one direction from closed position.

C. Fasten gate fabric to vertical (end) gate frame members using tension bars and bands as for fence fabric. Fasten fabric to top and bottom gate frame members and to intermediate braces with 11 gage wire ties or clips at minimum spacing of 14 inches on center.

D. Extend end frame members 18 inches vertically above top member of gate frame to support barbed wire.

E. Provide tension rods as diagonal braces on gates and secure rods at gate corner only.

3.9 TOP TENSION WIRE AND RAIL

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LANL Physical Security will determine if top tension wire or top rail is required.
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A. Provide [top] and bottom tension wire and stretch wire from end to end of each stretch of fence at height that will enable it to be fastened to fabric.

B. Stretch tension wire taut (not to exceed 6 inches sideway deflection) between terminal posts for securing fence fabric within 2 inches of [top and] bottom with hog rings at 18 inches on center, secure with wire ties to every third post minimum.

C. Provide top rail and support at each post so that a continuous brace from end to end of each stretch of fence is formed. Securely fasten top rail to terminal posts and join with sleeves or coupling to allow for expansion and contraction.

3.10 GENERAL REQUIREMENTS

A. Once in place, peen or spot-weld fence hardware to prevent easy removal.

B. Coat damaged galvanized finish with zinc-enriched paint.

C. Leave area of installation neat and free of debris caused by erection of fence.

3.11 ELECTRICAL GROUNDING

A. Bond gateposts on both sides of gate openings using direct buried grounding cable and cable to pipe clamps. Bond gateposts to gates using flexible braid and flexible braid to pipe clamps. Ground posts on both ends of gates; steel posts set in concrete will be considered as adequately grounded.

B. Ground permanent metallic fences crossed by overhead power at every third post for a distance of 50 feet from the crossing; chain link fences with steel post set in concrete will be considered as adequately grounded.

C. Ground metal fences surrounding substations and switching stations to station ground system in accordance with the National Electrical Safety Codes and IEEE Std. 80.

3.12 EXCAVATION, BACKFILL, AND COMPACTION

A. Refer to Section 02310.

END OF SECTION